IRON-ABSORPTION BAND ANALYSIS FOR THE DISCRIMINATION OF IRON-RICH ZONES

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Type I Progress Report
ERTS-A

a. Title: Iron-absorption band analysis for the discrimination of iron-rich zones.

ERTS-A Proposal No.: 9648

b. GSFC ID No. of P.I.: I 345

c. Problems relating to progress:

Prints accompanying the ERTS positives and negatives are almost invariably too dense for useful discrimination of tonal differences among the bands. If processed correctly, these prints would be invaluable in the examination of new data and as handy future references. With the present large volume of data, it is impossible in terms of time and cost to generate new prints for every image.

Field work in the area has been postponed several times due to heavy snowfall in the Western United States.

d. Discussion and plans:

A series of overlays is currently being made up using an image mosaic of Nevada (scale 1:1,000,000) as a base. The overlays include:

1) known information
   a) geology: structure and lithology based on a nearly completed map of Nevada by the U.S. Geological Survey and the Nevada Bureau of Mines
   b) aeromagnetic data: also near completion
   c) gravity data
   d) earthquake epicenters
   e) thermal features
   f) separate overlays of metal mining districts
   g) volcanic centers and calderas
2) information derived directly from mosaic
   a) major lineaments
   b) minor lineaments
   c) circular and elliptical features

Field work in the study area is now planned for the first week in May.

e. Results and applications:

Lineament analysis of the study area was initiated on individual images and then expanded areally by the use of mosaics at the 1:1,000,000 scale. Principal trends are NE, NW, NNE-NNW, and ENE. Several previously unrecognized lineaments are mapped which may be the surface manifestations of major fault or fracture zones.

Three lineaments are especially noteworthy. Two of these, the Walker Lane and the Midas Trench lineament system, transect the predominantly NNE-NNW trending mountain ranges for more than 500 km. A third major lineament, formed by the alinement of several topographic escarpments 10-20 km long, is orthogonal

to the Midas Trench lineament. This lineament is marked by a distinct positive magnetic anomaly for approximately 200 km. (Mabey, 1966; Robinson, 1970)

Further visual analysis of ERTS images has resulted in the delineation of 50 circular or elliptical features which are presumed to be volcanic or intrusive centers. A comparison with the 78 Tertiary volcanic centers mapped in the study area by Albers and Kleinhampl (1970) indicates some good agreement between the proposed and known volcanic centers. Eight of the 21 proposed centers which do not correlate at all with the Tertiary data of Albers and Kleinhampl appear to be major centers. Alinements of centers in the Walker Lane and along the northeastern part of the Midas Trench lineament zone are reasonably convincing. Many centers, however, seem to have no obvious relationship with the main lineaments.

The coincidence of some major lineaments and productive ore bodies, namely gold, silver, copper, lead and zinc as compiled by Jerome and Cook (1967), implies a genetic relationship. Productive districts occur preferentially along the ENE-trending lineaments in the Walker Lane and along the northeastern part of the Midas Trench lineament zone. In addition, the intersection of three previously unmapped lineaments in northwestern Nevada is the location of a highly productive metallogenic district. Some Tertiary volcanic centers appear to localize the ore deposits. Where centers are situated along lineaments, however, assessment of the role of Tertiary volcanism is more difficult because of the strong correlation of mines and lineaments.

Expansion of those preliminary results through use of overlays listed above, field work and statistical analysis should provide a clearer understanding of the comples and economically important terrain of Nevada.

References Cited

Albers, J.P., and Kleinhampl, F.J., 1970, Spatial relations of mineral deposits to Tertiary volcanic centers in Nevada, in Geol. Survey Research, 1970, Chpt. C: USGS Prof. Paper 700-C, p. C1-C10.

Mabey, D.R., 1966, Regional gravity and magnetic anomalies in part of Eureka County, Nevada, in Mining Geophysics, v. 1, Case Histories: Soc. Exploration Geophysicists, p. 77-83.

Jerome, S.E., and Cook, D.R., 1967, Relation of some metal mining districts in the western U.S. to regional tectonic environment and igneous activity: Nev. Bureau Mines Bull. 69, 35 p.

Robinson, E.S., 1970, Relations between geologic structure and aeromagnetic anomalies in central Nevada: Geol. Soc. America Bull., v. 81, p. 2045-2060.

f. Reports:

The following reports were prepared during February and submitted for publication to the ERTS-1 Symposium, March 5-9, 1973.

1. Rowan, Lawrence C. and Wetlaufer, Pamela H., 1973, Structural geologic and radiometric analysis of ERTS-1 images of Nevada and southern California (abs).

2. Rowan, Lawrence C. and Wetlaufer, Pamela H., 1973, Structural geologic analysis of Nevada using ERTS-1 images: A preliminary report.

g. Changes in operation:

none

h. Changes in standing order forms:

none

i. ERTS Image Descriptor forms:

no changes

j. Data Request forms:

no changes